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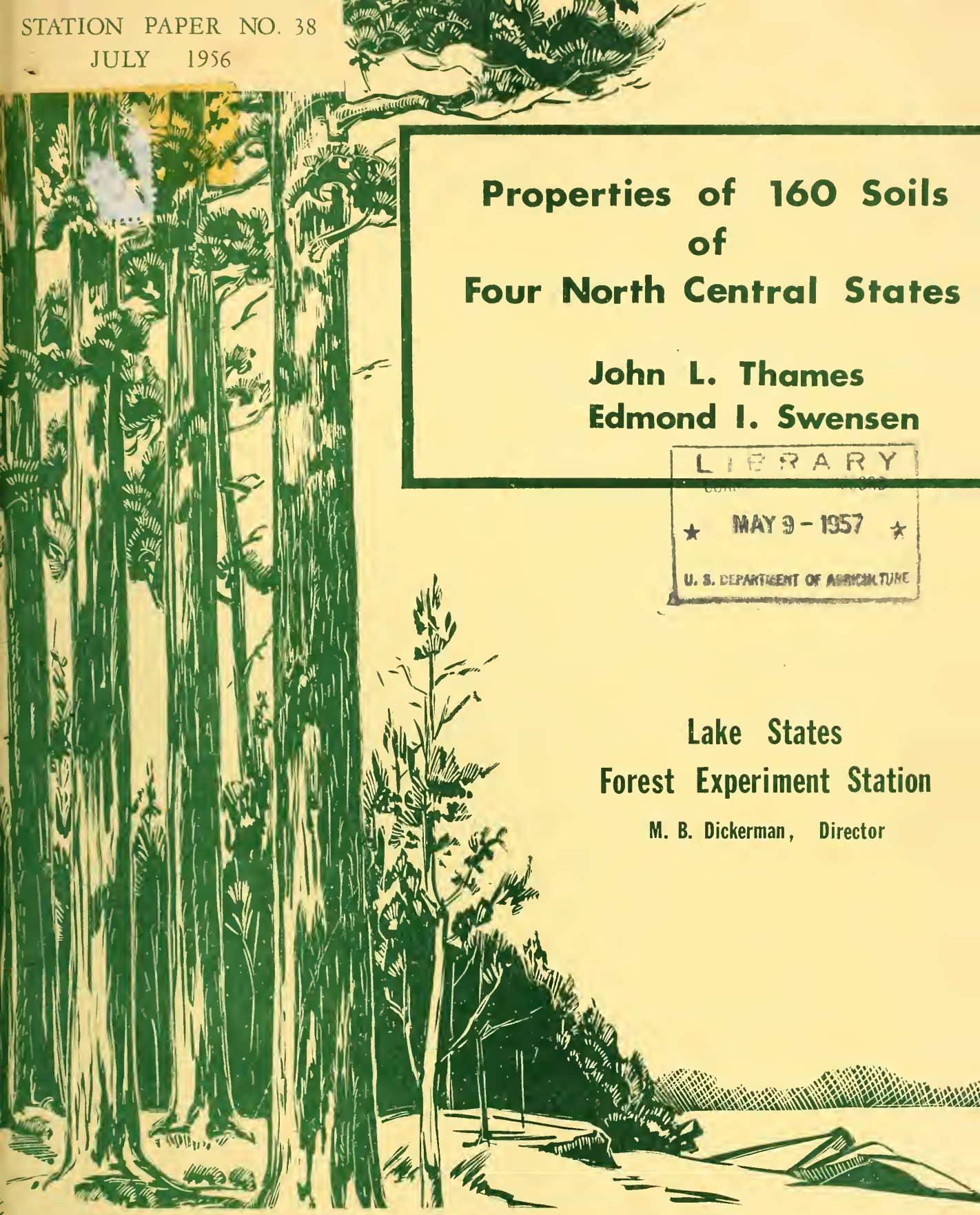

Properties of 160 Soils of Four North Central States

John L. Thames
Edmond I. Swensen

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U. S. DEPARTMENT OF AGRICULTURE
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ST. PAUL, MINNESOTA

PROPERTIES OF 160 SOILS OF FOUR NORTH CENTRAL STATES

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From June 1954 to July 1955, the Vicksburg Infiltration Project 2/ collected and analyzed soil samples from 160 sites located in northern Illinois, Iowa, Minnesota, and Wisconsin. This work was done to supply the U. S. Army with information needed for specialized research on military trafficability. The basic data obtained are herein presented because of their interest to soil scientists generally. The soil series sampled may be considered typical of the soils in the prairie and glaciated regions of this portion of the Midwest.

Sixty-five soil series are listed alphabetically in Table 1. Soils were identified whenever possible from detailed farm plans made by the Soil Conservation Service or from soil survey descriptions used in connection with county reconnaissance soil maps. Twenty-one soils were not classified.

The general locations of the sites are shown on figure 1, in which each dot represents a weather station. One to five sites were located within five miles of each of these stations. The weather station and sampling site were not always in the same county.

Tables 2 to 5 (one table for each State) characterize the individual sample sites and summarize the information on soil properties. The published records of the listed weather stations give the approximate longitude, latitude, elevation, and climate of the sites.

In these tables, "vegetation and land use" refers to the cover type on the site and to any disturbance caused by man, such as cultivation, grazing, or the cutting of hay. Where none of these disturbances had occurred within five years, the site was classed as undisturbed.

A few sites were established on areas recently logged and on

1/ Maintained by the Forest Service, U. S. Department of Agriculture, at St. Paul 1, Minnesota, in cooperation with the University of Minnesota.

2/ Maintained at Vicksburg, Mississippi, cooperatively by the Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, and the Waterways Experiment Station, Corps of Engineers, U. S. Army.

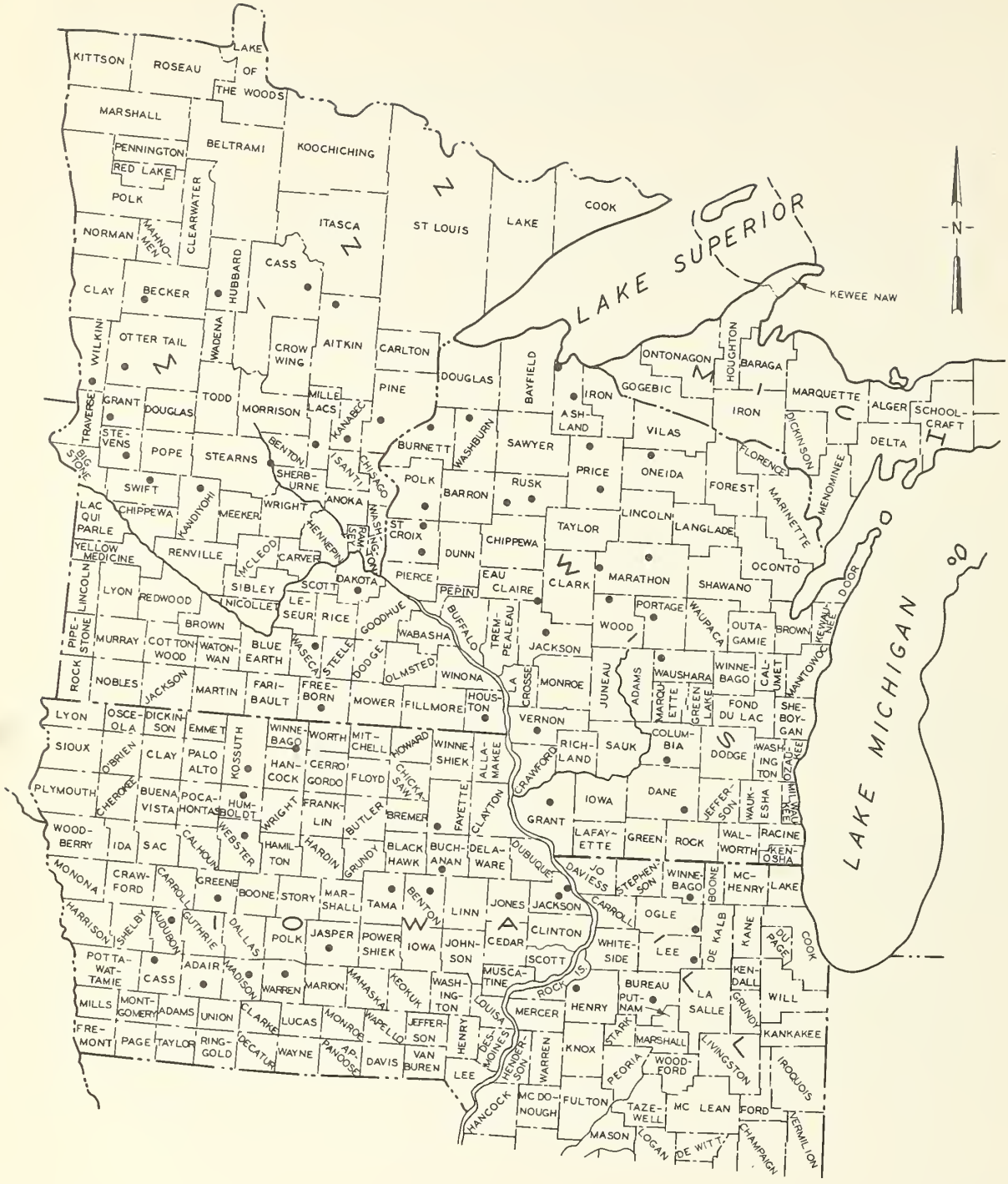

Figure 1. Location of the sites

Table 1.—Soil series studied

Series	State
Adolph	Minnesota
Afton	Wisconsin
Barnes	Minnesota
Boone	Wisconsin
Carrington	Iowa
	Wisconsin
Clarion	Iowa
	Minnesota
Clinton	Iowa
	Wisconsin
Cloquet	Minnesota
Coloma	Wisconsin
Clyde	Iowa
Dakota	Wisconsin
Dodgeville	Wisconsin
Dubuque	Minnesota
	Wisconsin
Edgerton	Wisconsin
Etter	Minnesota
Fargo	Minnesota
Fayette	Iowa
	Minnesota
	Wisconsin
Freer	Minnesota
	Wisconsin
Genesee	Iowa
	Wisconsin
Gloucester	Wisconsin
Greenbush	Minnesota
Grimstad	Minnesota
Hagner	Illinois
Harpster	Illinois
Hartsburg	Illinois
Hayden	Iowa
Hubbard	Minnesota
Huntsville	Illinois
Janesville	Wisconsin
Jewette	Wisconsin
Kennan	Wisconsin
Marshall	Iowa
Marshan	Minnesota
Menahga	Minnesota
Merrimack	Wisconsin
Miami	Illinois
	Wisconsin
Milaca	Minnesota
	Wisconsin
Muscatine	Illinois
	Iowa
Nicolett	Iowa
Omega	Minnesota
Onamia	Minnesota
	Wisconsin
Onarga	Illinois
O'Neill	Illinois
	Iowa
Ontonagon	Wisconsin
Plainfield	Iowa
	Wisconsin
Rockwood	Minnesota
Sable	Illinois
Sharpsburg	Iowa
Shelby	Iowa
Sioux	Minnesota
Sioux-Pierce	Minnesota
Spencer	Wisconsin
Spooner	Wisconsin
Storden	Iowa
Tama	Illinois
	Iowa
	Minnesota
	Wisconsin
Todd	Minnesota
Ulen	Minnesota
Union	Wisconsin
Vesper	Wisconsin
Vilas	Wisconsin
Wabash	Iowa
Wabash-Judson	Iowa
Waukesha	Wisconsin
Webster	Minnesota
	Iowa
Winterset	Iowa

land that was in cultivation in 1954. Areas that were not in cultivation during 1954 but had been cultivated some time within the five years preceding the survey were classed as cultivated previously—now grazed if they were being currently grazed by livestock; and as cultivated previously—now in hay if the cover was being cut for hay.

Areas that had not been cultivated for five years were classed as lightly grazed if they showed some animal use; as moderately grazed if they were being properly managed for grazing; as hay if no grazing was apparent and the cover cut for hay; and as lawn if they were mowed frequently.

The soil properties were determined from bulk samples and 2-inch cores taken randomly from a 12 by 18-foot plot at each site. Bulk samples, composited from six locations were taken from the 0 to 6-, 6 to 12-, and the 12 to 18-inch layers for determination of mechanical analysis, plasticity constants, and organic-matter content. No samples were taken below 18 inches.

Texture class follows the terminology given in the U. S. Department of Agriculture Soil Survey Manual, p. 210.[3/] The following symbols are used, alone or in combination:

S = sand

Si = silt

C = clay

L = loam

The mechanical composition was determined at the Mississippi Agricultural Experiment Station by a combination sieve and hydrometer method. The separation of medium- from fine-sized particles was based on Bouyoucos hydrometer readings taken only one hour after the suspension was mixed and adjusted to a pH of 9.5 with 0.01N sodium hydroxide. The figures for fine-particle content may thus include a portion of the particles usually classified as fine silt. However, the medium- and fine-sized particles are reported as silt and clay,

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3/ Soil Survey Staff, U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering.
Soil survey manual. U. S. Dept. Agr. Handbook 18, 503 pp., illus. 1951.

respectively. The figures are expressed in the table as percent of dry weight.

Organic-matter determinations were made by a modified Walkley rapid-dichromate oxidation method[4] at the Mississippi Agricultural Experiment Station and are expressed as percent of dry weight. The loss-on-ignition method, following modified procedures of the Association of Official Agricultural Chemists,[5] was used for samples when the organic-matter content was determined as over 5 percent by the Walkley method.

Stone content was estimated visually in the field for soils having significant proportions of fragments coarser than 2 mm. In some cases, stones of boulder size occurred on the sites. The stone content is expressed as percent by volume for the 0 to 18-inch layer.

The plasticity constants of the 6 to 12-inch layer were determined by the Soils Laboratory of the Waterways Experiment Station.[6] The figures are expressed as moisture content in percent of dry weight.

Bulk density and tension analysis were determined from 2-inch cores obtained with a drive-type sampler[7] when the soil was moist. Cores were taken in duplicate at the 0 to 3-inch, 3 to 6-inch, 6 to 9-inch, and 9 to 12-inch depths and averaged in the table by 6-inch layers. The moisture held by the soil at zero tension (saturation) was determined by weighing the 2-inch cores after they had been soaked in a pan of water.

4/ Peech, M., Alexander, L. T., Dean, L. A., and Reed, J. F.
Methods of soil analysis for soil-fertility investigations.
U. S. Dept. Agr. Cir. 757, 25 pp. 1947.

5/ Association of Official Agricultural Chemists.
Methods of analysis. Ed. 6, 932 pp., illus. Washington, D. C. 1945.

6/ ASTM Standards, published by the American Society for Testing Materials, Philadelphia, Pa. 1955.

7/ Broadfoot, W. M.
Procedures and equipment for determining soil bulk density.
U. S. Forest Service, Southern Forest Expt. Sta. Occas. Paper 135, pp. 2-11, illus. 1954.

As some water was lost during transfer, and as all pores are usually not filled by this method, these values are frequently less than the theoretical maximum. The 0.06 atmosphere tension values were determined by use of a tension table.[8/] The tension values are expressed in percent of dry weight.

8/ Leamer, R. W., and Shaw, B.
A simple apparatus for measuring non-capillary porosity on an extensive scale. Jour. Amer. Soc. Agron. 33:1003. 1941.

Table 2. Illinois soil series: site descriptions and soil properties

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. depth by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmosphere tension
Hagner*	30	Geneseo, Henry	Grasses, hay	Terrace 8 percent	0-6	LS	79	13	8	1.77					1.52	26.5	9.4
					6-12	LS	80	12	8	.70	0	Non-plastic			1.59	23.3	8.1
					12-18	SL	60	33	7	.55					---	---	---
Harpster*	28	Geneseo, Henry	Grasses, hay	Bottom level	0-6	SiCL	7	60	33	5.34					1.15	44.9	31.4
					6-12	SiCL	7	59	34	4.90	0	44	27	17	1.21	40.7	27.9
					12-18	SiCL	7	64	29	3.77					---	---	---
Hartsburg*	29	Geneseo, Henry	Grasses, hay	Upland 2 percent	0-6	CL	21	49	30	4.15					1.36	34.1	31.8
					6-12	SiCL	14	52	34	2.87	0	37	21	16	1.50	27.4	26.1
					12-18	SiCL	31	35	34	.70					---	---	---
Huntsville	27	Princeton, Bureau	Grasses, hay	Bottom level	0-6	L	50	37	13	2.87					1.54	25.7	20.4
					6-12	L	46	36	18	2.08	0	23	16	7	1.64	22.6	17.3
					12-18	L	33	43	24	2.08					---	---	---
Miami	22	Rockford, Winnebago	Grasses, lightly grazed	Upland 3 percent	0-6	SiL	5	69	26	3.41					1.22	40.6	30.5
					6-12	SiL	5	66	29	.78	0	27	20	7	1.22	39.3	28.0
					12-18	SiL	4	64	32	.55					---	---	---
Muscatine	23	Rochelle, Ogle	Grasses, hay	Upland 5 percent	0-6	SiCL	10	60	30	5.12					1.30	36.3	32.4
					6-12	SiCL	12	59	29	4.15	0	38	24	14	1.31	34.9	29.6
					12-18	SiCL	16	52	32	3.86					---	---	---
Onarga*	20	Rockford, Winnebago	Grasses, undisturbed	Upland 6 percent	0-6	SCL	55	25	20	3.77					1.14	41.4	33.7
					6-12	SCL	49	24	27	2.87	0	Non-plastic			1.48	24.6	24.0
					12-18	L	45	30	25	3.13					---	---	---
O'Neill*	18	Rockford, Winnebago	Oats, cultivated	Terrace level	0-6	CL	23	44	33	5.34					1.26	42.3	32.9
					6-12	CL	23	45	32	5.24	0	47	28	19	1.26	42.9	34.7
					12-18	CL	22	43	35	5.02					---	---	---
O'Neill*	19	Rockford, Winnebago	Grasses, lawn	Terrace level	0-6	CL	29	32	39	6.04					1.11	48.7	37.6
					6-12	CL	39	28	33	4.70	0	Non-plastic			1.20	41.3	34.6
					12-18	CL	42	27	31	4.15					---	---	---
Sable	24	Rochelle, Ogle	Grasses, hay	Upland level	0-6	SiCL	14	53	33	5.56					1.09	50.6	42.7
					6-12	SiCL	12	55	33	5.02	0	49	28	21	1.34	34.7	32.5
					12-18	SiCL	13	50	37	1.88					---	---	---
Sable	25	Paw Paw, Lee	Grasses, hay	Upland level	0-6	SiCL	5	59	36	5.34					1.20	42.6	38.3
					6-12	SiCL	4	59	37	4.70	0	48	29	19	1.18	42.8	37.5
					12-18	SiCL	3	59	38	3.00					---	---	---
Tama	26	Paw Paw, Lee	Grasses, hay	Upland 4 percent	0-6	SiCL	4	59	37	5.12					1.06	49.7	45.6
					6-12	SiCL	4	57	39	3.77	0	46	29	17	1.20	40.9	35.0
					12-18	SiCL	2	61	37	2.47					---	---	---

* Soil series identified from farm plan soil maps prepared by the Soil Conservation Service.

Table 3. Iowa soil series: site descriptions and soil properties

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. depth by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmospbere tension
Carrington	62	Oelwein, Fayette	Grasses, hay	Upland 6 percent	0-6	L	36	39	25	4.90					1.10	50.1	40.2
					6-12	L	43	37	20	4.70	0	35	23	12	1.32	35.6	31.3
					12-18	L	35	39	26	4.80					---	---	---
Carrington*	66	Independence, Buchanan	Grasses, hay	Upland 4 percent	0-6	CL	24	47	29	4.70					1.28	37.0	32.2
					6-12	L	28	46	26	2.23	0	39	16	23	1.37	32.6	27.7
					12-18	L	30	47	23	.95					---	---	---
Carrington	67	Vinton, Benton	Grasses, hay	Upland 5 percent	0-6	L	50	34	16	5.34					1.28	34.0	29.6
					6-12	L	51	35	14	2.23	0	22	16	6	1.48	29.0	24.3
					12-18	L	48	36	16	1.15					---	---	---
Carrington	68	Vinton, Benton	Grasses and weeds, lightly grazed	Upland 5 percent	0-6	LS	75	21	4	1.25					1.52	---	11.4
					6-12	SL	74	20	6	.86	0	Non-plastic			1.49	---	10.1
					12-18	SL	71	21	8	.78					---	---	---
Carrington*	74	Traer, Tama	Grasses, moderately grazed	Upland 5 percent	0-6	CL	23	50	27	5.24					1.20	42.5	34.5
					6-12	CL	24	49	27	2.87	0	35	21	14	1.26	35.4	28.3
					12-18	CL	25	48	27	2.08					---	---	---
Clarion*	94	Fort Dodge, Webster	Alfalfa, hay	Upland 3 percent	0-6	CL	28	41	31	3.96					1.46	29.2	27.8
					6-12	CL	28	43	29	1.98	0	29	16	13	1.54	24.2	22.9
					12-18	CL	28	45	27	.78					---	---	---
Clarion*	96	Dakota City, Humboldt	Alfalfa and clover, hay	Upland 3 percent	0-6	L	37	36	27	4.34					1.19	43.9	34.1
					6-12	L	40	34	26	3.96	0	36	20	16	1.23	37.1	33.8
					12-18	CL	39	30	31	3.62					---	---	---
Clinton	69	Vinton, Benton	Walnut, hickory and elm, logged	Upland 8 percent	0-6	SiL	13	69	18	3.96					1.09	44.0	39.7
					6-12	SiL	11	71	18	1.65	0	27	22	5	1.32	34.8	30.2
					12-18	SiCL	12	60	28	.86					---	---	---
Clinton	32	Andrew, Jackson	Clover, hay	Upland 7 percent	0-6	SiL	28	51	21	3.62					1.30	35.0	29.0
					6-12	SiL	24	57	19	1.45	0	26	20	6	1.44	30.7	24.6
					12-18	L	35	41	24	.38					---	---	---
Clinton	37	Bellevue, Jackson	Grasses, moderately grazed	Upland 4 percent	0-6	SiC	5	51	44	3.62					1.34	36.4	29.8
					6-12	C	1	26	73	2.35	0	45	23	22	1.34	39.1	35.5
					12-18	C	3	31	66	1.05					---	---	---
Clyde*	64	Independence, Buchanan	Grasses, moderately grazed	Bottom level	0-6	L	31	49	20	4.15					1.34	34.0	30.9
					6-12	L	39	43	18	1.05	0	30	16	14	1.49	28.0	23.8
					12-18	L	29	47	24	.38					---	---	---
Fayette	36	Bellevue, Jackson	Grasses, moderately grazed	Terrace 3 percent	0-6	SL	56	28	16	1.65					1.40	26.3	22.6
					6-12	SL	56	26	18	1.55	0	Non-plastic			1.60	22.7	18.3
					12-18	SL	53	29	18	.55					---	---	---
Genesee	35	Bellevue, Jackson	Grasses, hay	Bottom level	0-6	SiL	13	68	19	3.41					1.40	33.6	30.9
					6-12	SiL	3	71	26	2.47	0	39	25	14	1.44	30.6	29.6
					12-18	SiL	12	62	26	1.98					---	---	---
Hayden*	95	Dakota City, Humboldt	Oak and grasses, moderately grazed	Upland 3 percent	0-6	L	43	32	25	4.70					1.21	38.7	31.3
					6-12	L	50	28	22	3.13	0	32	19	13	1.38	31.8	27.8
					12-18	SCL	53	24	23	1.65					---	---	---
Marshall	89	Audubon, Audubon	Grasses, lightly grazed	Upland 11 percent	0-6	SiCL	5	62	33	4.70					1.13	46.9	39.1
					6-12	SiCL	3	66	31	.86	0	43	25	18	1.08	50.7	40.2
					12-18	SiCL	3	60	37	1.88					---	---	---
Muscatine	31	Andrew, Jackson	Grasses, undisturbed	Upland 4 percent	0-6	SiCL	5	66	29	3.27					1.21	45.2	37.8
					6-12	SiCL	4	66	30	1.45	0	35	23	12	1.38	35.4	29.5
					12-18	SiCL	4	69	27	1.55					---	---	---
Muscatine*	72	Traer, Tama	Grasses, lightly grazed	Upland level	0-6	SiCL	4	60	36	4.15					1.26	37.4	32.4
					6-12	SiCL	3	65	32	2.75	0	45	24	21	1.13	45.3	35.3
					12-18	SiCL	2	62	36	1.88					---	---	---
Muscatine*	75	Newton, Jasper	Grasses, hay	Upland 2 percent	0-6	SiCL	4	65	31	4.60					1.31	35.3	30.0
					6-12	SiCL	3	64	33	3.62	0	41	24	17	1.36	34.9	28.7
					12-18	SiCL	3	67	30	3.96					---	---	---
Nicolett*	98	Algona, Kossuth	Alfalfa and clover, hay	Upland 3 percent	0-6	CL	37	34	29	5.56					1.14	46.7	42.3
					6-12	CL	41	32	27	5.12	0	43	24	19	1.12	47.2	43.0
					12-18	L	41	35	24	5.12					---	---	---
O'Neill	61	Oelwein, Fayette	Grasses, undisturbed	Terrace 2 percent	0-6	SL	62	22	16	5.80					1.21	35.5	27.8
					6-12	SL	55	26	19	3.96	0	Non-plastic			1.36	30.9	24.8
					12-18	SL	54	30	16	3.62					---	---	---
O'Neill	91	Jefferson, Greene	Oak, walnut and grasses, lightly grazed	Upland 12 percent	0-6	L	31	45	24	5.12					1.10	51.3	36.7
					6-12	CL	29	41	30	3.27	0	34	20	14	1.27	38.6	30.5
					12-18	CL	27	46	27	3.96					---	---	---

* Soil series identified from farm plan soil maps prepared by the Soil Conservation Service.

(Continued)

Table 3. Iowa soil series: site descriptions and soil properties (continued)

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. depth by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmosphere tension
Plainfield	63	Oelwein, Fayette	Grasses and clover, hay	Terrace 3 percent	0-6	SL	60	26	14	1.45					1.47	26.8	20.5
					6-12	SL	60	24	16	.95	0	15	13	2	1.48	25.9	19.2
					12-18	SL	71	20	9	.38					---	---	---
Sharpsburg*	78	Indianola, Warren	Grasses, hay	Upland 3 percent	0-6	SiCL	3	62	35	5.12					1.26	37.1	30.2
					6-12	SiCL	2	59	39	4.15	0	44	25	19	1.24	37.9	31.5
					12-18	SiCL	3	60	37	3.62					---	---	---
Sharpsburg*	79	Winterset, Madison	Grasses, lawn	Upland 3 percent	0-6	SiCL	4	65	31	5.56					1.14	45.6	39.8
					6-12	SiCL	2	63	35	4.05	0	45	26	19	1.22	41.3	34.9
					12-18	SiCL	2	61	37	3.13					---	---	---
Shelby*	77	Indianola, Warren	Grasses, hay	Upland 8 percent	0-6	SiCL	14	58	28	5.12					1.16	43.1	36.1
					6-12	SiCL	16	56	27	3.54	0	39	22	17	1.22	39.9	31.0
					12-18	SiCL	17	62	31	3.41					---	---	---
Shelby*	80	Winterset, Madison	Walnut and elm, undisturbed	Upland 25 percent	0-6	SiCL	10	51	39	4.52					1.34	35.3	31.4
					6-12	SiC	3	40	57	3.69	0	51	22	29	1.44	31.7	31.0
					12-18	C	1	34	65	.86					---	---	---
Shelby	83	Greenfield, Adair	Grasses, hay	Upland 6 percent	0-6	CL	31	36	33	2.60					1.36	34.9	32.2
					6-12	CL	29	36	35	1.33	0	41	21	20	1.43	31.7	29.9
					12-18	CL	27	35	38	1.05					---	---	---
Shelby*	86	Atlantic, Cass	Grasses, bay	Upland 8 percent	0-6	SiCL	5	59	36	1.65					1.34	36.1	29.5
					6-12	SiCL	4	62	34	.07	0	43	21	22	1.32	37.0	32.3
					12-18	SiCL	2	64	34	.01					---	---	---
Storden*	90	Jefferson, Greene	Walnut, oak and grasses, undisturbed	Upland 20 percent	0-6	L	31	46	23	4.70					1.21	41.2	37.0
					6-12	CL	27	40	23	1.45	0	33	16	17	1.38	32.6	28.9
					12-18	CL	29	38	33	.86					---	---	---
Tama	70	Vinton, Benton	Grasses, hay	Upland 11 percent	0-6	SiCL	6	62	32	4.05					1.30	35.7	32.4
					6-12	SiCL	4	66	30	3.77	0	45	27	18	1.22	38.2	33.6
					12-18	SiCL	4	62	34	3.77					---	---	---
Tama	71	Traer, Tama	Clover and grasses, hay	Upland 3 percent	0-6	SiCL	4	60	36	5.12					1.07	48.4	38.5
					6-12	SiCL	2	62	36	3.96	0	44	26	18	1.10	46.3	39.1
					12-18	SiCL	3	61	36	3.62					---	---	---
Tama	82	Greenfield, Adair	Grasses, hay	Upland 2 percent	0-6	SiCL	3	62	35	2.75					1.35	35.3	34.1
					6-12	SiCL	3	64	33	.46	0	47	21	26	1.46	30.6	29.7
					12-18	SiCL	2	61	37	.46					---	---	---
Tama	87	Audubon, Audubon	Grasses, moderately grazed	Upland 8 percent	0-6	SiCL	3	59	38	3.62					1.30	35.4	31.4
					6-12	SiCL	3	61	36	2.60	0	40	23	17	1.29	37.2	32.9
					12-18	SiCL	3	61	36	3.13					---	---	---
Wabash	73	Traer, Tama	Grasses, undisturbed	Bottom 2 percent	0-6	SiCL	12	56	32	5.80					1.02	54.2	41.7
					6-12	SiCL	14	52	34	5.34	0	55	34	21	1.01	56.9	46.2
					12-18	SiCL	17	55	28	5.02					---	---	---
Wabash	76	Newton, Jasper	Grasses, bay	Bottom 2 percent	0-6	SiCL	5	65	38	5.56					1.11	47.4	39.9
					6-12	SiCL	3	64	39	4.90	0	47	27	20	1.26	39.1	33.0
					12-18	SiC	3	67	41	4.70					---	---	---
Wabasb	84	Greenfield, Adair	Grasses, hay	Bottom level	0-6	SiCL	9	60	31	4.52					1.21	40.6	38.2
					6-12	SiCL	9	58	35	4.70	0	47	28	30	1.19	42.4	39.1
					12-18	SiCL	10	57	33	3.77					---	---	---
Wabash	88	Audubon, Audubon	Grasses, hay	Bottom level	0-6	SiCL	4	62	34	3.77					1.02	54.0	43.2
					6-12	SiCL	3	60	37	3.96	0	48	27	21	1.00	53.5	43.2
					12-18	SiCL	3	58	39	4.90					---	---	---
Wabash-Judson	85	Atlantic, Cass	Grasses and weeds, undisturbed	Bottom level	0-6	SiC	4	45	57	2.23					1.02	53.6	45.7
					6-12	SiC	5	48	47	1.05	0	52	22	30	1.31	38.5	30.7
					12-18	SiC	8	51	41	.55					---	---	---
Webster	92	Jefferson, Greene	Grasses, lightly grazed	Upland 2 percent	0-6	CL	26	43	31	5.34					1.19	42.8	34.3
					6-12	CL	26	39	35	4.15	0	43	22	21	1.26	40.3	34.8
					12-18	CL	27	40	33	2.87					---	---	---
Webster	93	Fort Dodge, Webster	Grasses, moderately grazed	Upland level	0-6	CL	29	44	27	4.60					1.10	48.7	39.4
					6-12	CL	26	41	33	4.90	0	50	25	25	1.24	39.4	34.7
					12-18	CL	30	37	33	3.77					---	---	---
Webster	99	Forest City, Winnebago	Grasses, hay	Upland level	0-6	SiCL	8	58	34	5.34					.98	60.0	51.6
					6-12	SiCL	5	60	35	.86	0	34	21	13	1.15	45.0	37.9
					12-18	SiCL	5	60	35	1.88					---	---	---
Winterset	81	Winterset, Madison	Grasses, hay	Upland 2 percent	0-6	SiCL	3	64	33	5.24					1.21	40.9	34.5
					6-12	SiCL	2	61	37	3.62	0	45	23	22	1.36	34.5	26.5
					12-18	SiC	2	55	43	2.60					---	---	---
Outwash Material	97	Algonia, Kossuth	Grasses, moderately grazed	Terrace 2 percent	0-6	L	42	38	20	4.90					1.18	41.9	36.4
					6-12	L	45	34	21	3.77	0	37	21	16	1.22	38.6	35.6
					12-18	L	50	29	21	2.60					---	---	---

* Soil series identified from farm plan soil maps prepared by the Soil Conservation Service.

Table 4. Minnesota soil series: site descriptions and soil properties

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. depth by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmosphere tension
Adolph	157	Milaca, Mille Lacs	Grasses and clover, lightly grazed	Upland level	0-6	L	35	50	15	5.80					1.16	43.0	35.5
					6-12	CL	30	38	32	1.25	1	36	18	18	1.45	27.0	23.8
					12-18	L	50	30	20	.70					---	---	---
Adolph	161	Hinckley, Pine	Birch and grasses, undisturbed	Upland 5 percent	0-6	SiL	28	57	15	4.15					1.20	41.0	34.7
					6-12	SiL	30	59	11	1.05	1	Non-plastic			1.45	27.7	23.2
					12-18	L	39	49	12	.62					---	---	---
Barnes*	137	Fergus Falls, Otter Tail	Grasses and clover, bay	Upland 8 percent	0-6	CL	34	37	29	4.52					1.11	45.0	36.2
					6-12	CL	32	36	32	2.75	3	34	18	16	1.22	39.5	31.7
					12-18	SCL	53	16	31	1.45					---	---	---
Barnes*	138	Fergus Falls, Otter Tail	Grasses, lightly grazed	Upland 6 percent	0-6	L	36	43	21	5.34					.99	55.0	45.0
					6-12	SL	57	27	16	3.96	5	35	21	14	1.14	45.5	35.7
					12-18	SL	55	28	17	1.33					---	---	---
Clarion*	105	Waseca, Waseca	Grasses, lightly grazed	Upland 3 percent	0-6	L	34	43	23	5.12					1.06	48.9	43.7
					6-12	CL	34	35	31	1.15	0	31	17	14	1.34	32.0	29.4
					12-18	L	36	39	25	3.00					---	---	---
Clarion	148	Morris, Stevens	Flax, cultivated	Upland 2 percent	0-6	SiL	19	59	22	5.80					1.22	40.0	37.6
					6-12	SiCL	17	55	28	3.62	0	45	22	23	1.25	38.8	36.5
					12-18	SiL	16	58	26	1.98					---	---	---
Cloquet	167	Danhury, Wis., Pine	Birch and alder, undisturbed	Upland level	0-6	SL	60	27	13	4.70					1.30	36.5	32.2
					6-12	SL	66	24	10	1.05	15	Non-plastic			1.58	23.6	19.2
					12-18	SL	54	32	14	.38					---	---	---
Dubuque	60	Caledonia, Houston	Grasses, lightly grazed	Upland 5 percent	0-6	L	34	47	19	2.87					1.28	---	29.0
					6-12	L	38	42	20	1.45	0	24	15	9	1.38	---	29.0
					12-18	SL	55	31	14	.78					---	---	---
Etter*	106	Farmington, Dakota	Grasses, bay	Upland 3 percent	0-6	SL	72	19	9	1.25					1.50	24.6	21.5
					6-12	SL	67	22	11	1.25	0	17	16	1	1.40	27.0	23.0
					12-18	SL	62	27	11	1.25					---	---	---
Fargo*	139	Camphell, Wilkin	Flax, cultivated	Upland level	0-6	C	9	39	52	5.34					1.06	52.0	46.3
					6-12	C	10	36	54	.95	0	55	21	34	1.22	43.3	38.3
					12-18	C	8	38	54	.78					---	---	---
Fargo	146	Morris, Stevens	Grasses, hay	Upland level	0-6	CL	22	40	38	5.92					.98	58.2	51.3
					6-12	CL	20	46	34	5.56	0	54	30	24	1.12	49.1	41.9
					12-18	CL	20	40	40	4.05					---	---	---
Fayette	58	Caledonia, Houston	Grasses, lightly grazed	Upland 10 percent	0-6	SiL	7	69	24	3.54					1.30	38.6	31.5
					6-12	SiCL	34	62	4	.55	0	37	22	15	1.46	29.7	26.0
					12-18	SiCL	32	63	5	.70					---	---	---
Freer	162	Hinckley, Pine	Grasses, grazed	Upland level	0-6	SiCL	18	52	30	5.56					1.15	46.9	45.0
					6-12	CL	24	46	30	2.60	1	31	23	8	1.35	33.5	31.6
					12-18	CL	20	45	35	1.25					---	---	---
Greenbusb	158	Mora, Kanabec	Grasses and clover, bay	Terrace 2 percent	0-6	L	35	50	15	3.77					1.38	26.5	19.3
					6-12	CL	30	38	32	.70	15	19	16	3	1.51	24.1	19.1
					12-18	L	50	30	20	.46					---	---	---
Grimstad*	140	Campbell, Wilkin	Flax, cultivated	Upland level	0-6	SL	52	29	19	4.05					1.15	---	31.5
					6-12	SL	53	29	18	2.75	0	31	18	13	1.35	---	26.6
					12-18	SL	50	18	32	1.25					---	---	---
Huhbard	130	Park Rapids, Hubbard	Grasses, lightly grazed	Upland 2 percent	0-6	SL	66	23	11	4.52					1.22	39.8	32.0
					6-12	SL	62	28	10	1.25	13	Non-plastic			1.40	31.2	27.6
					12-18	SL	68	22	10	1.25					---	---	---
Hubbard	133	Park Rapids, Hubbard	Grasses, bay	Upland 2 percent	0-6	SL	63	28	9	3.96					1.47	26.1	20.6
					6-12	SL	60	28	12	2.08	3	Non-plastic			1.52	24.8	18.4
					12-18	SL	67	22	11	1.25					---	---	---
Marsban*	107	Farmington, Dakota	Grasses, bay	Bottom level	0-6	L	29	47	24	6.28					.89	69.0	59.8
					6-12	CL	30	42	28	5.68	0	50	27	23	1.16	42.3	36.6
					12-18	L	32	43	25	4.90					---	---	---
Menabga	132	Park Rapids, Hubbard	Jack pine, undisturbed	Upland 5 percent	0-6	LS	84	12	4	1.25					1.50	25.4	10.2
					6-12	LS	82	13	5	.46	3	Non-plastic			1.55	23.2	9.2
					12-18	LS	78	17	5	.32					---	---	---
Milaca	163	Hinckley, Pine	Grasses, bay	Upland 3 percent	0-6	SiL	18	60	22	3.27					1.22	41.4	35.7
					6-12	SiL	16	68	16	.55	1	21	19	2	1.49	33.5	24.4
					12-18	SiL	27	54	19	.20					---	---	---
Milaca	159	Mora, Kanabec	Grasses and clover, ligbtly grazed	Upland 8 percent	0-6	SiL	14	60	26	6.28					1.22	40.6	35.4
					6-12	SiL	13	60	17	1.65	1	26	24	2	1.34	34.0	31.2
					12-18	SiL	15	59	26	.95					---	---	---
Milaca	156	Milaca, Mille Lacs	Grasses, undisturbed	Upland 3 percent	0-6	SiL	26	58	16	2.87					1.24	40.4	35.6
					6-12	SiL	30	52	18	.55	10	22	19	3	1.51	25.1	22.5
					12-18	L	38	40	22	.46					---	---	---

* Soil series identified from farm plan soil maps prepared by the Soil Conservation Service.

(Continued)

Table 4. Minnesota soil series: site descriptions and soil properties (continued)

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. depth by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmosphere tension
Omega	166	Danbury, Wis., Pine	Grasses, hay	Upland 4 percent	0-6	SiL	31	59	10	2.35					1.47	27.9	24.9
					6-12	L	51	39	10	.70	5		Non-plastic		1.59	22.9	20.0
					12-18	SL	57	33	10	.38					---	---	---
Onamia	155	Milaca Mille Lacs	Grasses, lightly grazed	Upland level	0-6	SiL	33	54	13	2.87					1.30	36.1	30.5
					6-12	SiL	34	50	16	.78	15	20	19	1	1.48	26.4	23.6
					12-18	SiL	34	52	14	.38					---	---	---
Onamia	160	Mora, Kanabec	Grasses, undisturbed	Upland 2 percent	0-6	SiL	29	53	18	3.41					1.34	32.7	27.4
					6-12	L	41	41	18	1.88	2	22	20	2	1.56	24.5	21.6
					12-18	SiL	29	55	16	.95					---	---	---
Onamia	164	Hinckley, Pine	Grasses, hay	Upland 2 percent	0-6	SiL	15	69	16	3.00					1.22	---	32.0
					6-12	SiL	13	74	13	.86	1		Non-plastic		1.43	---	27.5
					12-18	SiL	11	73	16	.62					---	---	---
Onamia	165	Danbury, Wis., Pine	Aspen, oak and birch, undisturbed	Upland 6 percent	0-6	SL	75	19	6	2.87					1.38	32.2	26.3
					6-12	SL	73	21	6	.78	2		Non-plastic		1.32	31.9	25.4
					12-18	LS	79	16	5	.78					---	---	---
Rockwood	134	Park Rapids, Hubbard	Grasses and weeds, undisturbed	Upland 5 percent	0-6	SL	63	29	8	4.60					1.39	29.9	20.7
					6-12	SL	69	21	10	.86	3		Non-plastic		1.46	25.9	18.1
					12-18	SL	67	26	7	.62					---	---	---
Sioux	147	Morris, Stevens	Grasses, grazed	Terrace 6 percent	0-6	L	33	46	21	4.80					1.23	39.2	33.9
					6-12	L	32	47	21	3.69	0	39	22	17	1.24	39.1	35.3
					12-18	L	44	33	23	2.35					---	---	---
Sioux-Pierce	136	Detroit Lakes, Becker	Oak-maple-elm, undisturbed	Upland 10 percent	0-6	SL	67	24	9	5.34					1.12	40.8	30.3
					6-12	LS	78	15	7	2.35	4		Non-plastic		1.50	24.8	14.3
					12-18	SL	75	18	7	2.08					---	---	---
Tama	59	Caledonia, Houston	Grasses, hay	Upland 3 percent	0-6	SiCL	6	66	28	3.77					1.20	41.7	35.3
					6-12	SiCL	4	64	32	3.77	0	41	26	15	1.23	38.3	32.8
					12-18	SiCL	4	65	31	3.62					---	---	---
Todd	131	Park Rapids, Hubbard	Grasses, hay	Upland 7 percent	0-6	LS	82	14	4	1.15					1.50	26.5	22.4
					6-12	SL	72	19	9	.78	8		Non-plastic		1.50	22.2	17.6
					12-18	SL	70	19	11	.62					---	---	---
Ulen*	142	Campbell, Wilkin	Grasses, bay	Terrace level	0-6	CL	40	32	28	2.35					1.34	34.1	30.4
					6-12	C	11	37	52	1.15	0	50	19	31	1.44	30.1	28.4
					12-18	C	15	33	52	.86					---	---	---
Webster*	104	Waseca, Waseca	Grasses, lightly grazed	Upland 3 percent	0-6	CL	32	34	34	5.68					1.14	45.3	40.7
					6-12	CL	29	38	33	4.34	0	46	28	18	1.22	42.6	39.0
					12-18	CL	30	33	37	2.87					---	---	---
Undifferentiated Lacustrine*	135	Detroit Lakes, Becker	Grasses, moderately grazed	Bottom 2 percent	0-6	SiL	23	50	27	5.80					1.08	51.1	45.0
					6-12	SiL	20	55	25	5.12	2	38	25	13	1.31	35.6	32.9
					12-18	L	36	45	19	4.15					---	---	---
	102	Albert Lea, Freeborn	Grasses and clover, hay	Upland 8 percent	0-6	CL	24	49	27	5.12					1.17	43.4	38.3
					6-12	CL	22	51	27	3.62	0	36	21	15	1.37	33.6	29.7
					12-18	CL	26	46	28	2.08					---	---	---
	103	Albert Lea, Freeborn	Oak, logged	Upland 6 percent	0-6	SiL	34	52	14	4.90					1.13	49.2	43.4
					6-12	SL	55	27	18	1.98	0	24	15	9	1.42	29.8	26.6
					12-18	SL	57	26	17	1.05					---	---	---
	126	Hill City, Aitkin	Aspen, undisturbed	Bottom level	0-6	SiL	25	65	10	2.47					1.05	52.2	43.1
					6-12	SiL	38	54	8	.55	0		Non-plastic		1.37	30.7	26.3
					12-18	SL	60	32	8	.55					---	---	---
	127	Hill City, Aitkin	Birch and maple, undisturbed	Upland 6 percent	0-6	SiL	21	69	10	3.00					1.17	42.4	37.7
					6-12	SiL	22	67	11	.70	1		Non-plastic		1.31	33.8	29.0
					12-18	SiL	21	70	9	.55					---	---	---
	128	Remer, Cass	Maple and ash, undisturbed	Upland 4 percent	0-6	SiCL	16	57	27	6.28					1.01	---	40.7
					6-12	SiCL	6	54	40	1.65	25	23	19	4	1.30	---	20.2
					12-18	SiC	4	45	51	1.15					---	---	---
	129	Remer, Cass	Maple and basswood, undisturbed	Upland 12 percent	0-6	L	34	40	26	4.05					1.15	47.8	40.3
					6-12	SiC	4	44	52	1.15	1	39	22	17	1.38	34.1	30.4
					12-18	SiC	3	40	57	.78					---	---	---
	144	Herman, Grant	Flax, cultivated	Upland level	0-6	L	35	39	26	5.24					.96	60.3	51.6
					6-12	L	38	40	22	2.47	0	37	19	18	1.26	38.7	36.2
					12-18	CL	37	35	28	1.55					---	---	---
	149	Benson, Swift	Grasses, bay	Upland level	0-6	L	45	41	14	6.64					.80	80.2	69.4
					6-12	SL	63	19	18	4.34	0	31	17	14	1.33	31.6	26.9
					12-18	SL	74	12	14	.86					---	---	---
	150	Benson, Swift	Grasses, bay	Upland level	0-6	S	91	2	7	1.88					1.22	36.3	24.3
					6-12	LS	80	13	7	2.08	0		Non-plastic		1.44	28.6	21.9
					12-18	LS	87	9	4	1.25					---	---	---

* Soil series identified from farm plan soil maps prepared by the Soil Conservation Service.

(Continued)

Table 4. Minnesota soil series: site descriptions and soil properties (continued)

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. deptb by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmospbere tension
	151	New London, Kandiyohi	Grasses, undisturbed	Upland 6 percent	0-6	L	40	36	24	5.92					0.96	59.2	48.7
					6-12	SL	46	34	20	5.56	0	31	22	9	1.11	48.0	37.6
					12-18	L	43	36	21	4.60					---	---	---
	152	New London, Kandiyohi	Grasses, undisturbed	Upland 10 percent	0-6	SL	58	26	16	5.12					1.14	44.5	36.8
					6-12	SL	59	26	15	5.12	0	Non-plastic			1.18	43.0	33.1
					12-18	SL	52	32	16	5.12					---	---	---
	153	St. Cloud, Stearns	Grasses and weeds, undisturbed	Upland 2 percent	0-6	L	46	32	22	6.28					1.09	49.8	36.5
					6-12	SL	54	26	20	3.62	1	27	15	12	1.43	28.8	25.0
					12-18	L	44	36	20	1.25					---	---	---
	154	St. Cloud, Stearns	Grasses, hay	Upland level	0-6	SL	56	28	16	3.00					1.45	28.0	24.4
					6-12	L	50	32	18	1.65	2	19	14	5	1.53	24.5	20.6
					12-18	SL	58	27	15	.86					---	---	---

* Soil series identified from farm plan soil maps prepared by the Soil Conservation Service.

Table 5. Wisconsin soil series: site descriptions and soil properties

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. depth by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmosphere tension
Afton	17	Stoughton, Dane	Clover and grasses, hay	Upland level	0-6	LS	80	11	9	1.25					1.62	20.5	12.3
					6-12	LS	79	14	7	.78	0		Non-plastic		1.53	23.2	10.4
					12-18	LS	81	11	8	.12					---	---	---
Boone	44	Black River Falls, Jackson	Oak and aspen, undisturbed	Upland level	0-6	LS	80	14	6	1.55					1.24	39.6	25.2
					6-12	S	98	8	1	.38	0		Non-plastic		1.52	25.5	6.8
					12-18	S	93	3	4	.32					---	---	---
Boone	47	Black River Falls, Jackson	Oats, cultivated	Upland 3 percent	0-6	SL	62	26	12	2.35					1.54	23.4	19.4
					6-12	SL	65	24	11	1.65	0		Non-plastic		1.58	22.4	15.4
					12-18	SL	65	23	12	.55					---	---	---
Boone	48	Fairchild, Jackson	Grasses, lightly grazed	Upland 4 percent	0-6	SiL	20	61	19	3.13					1.39	31.9	24.2
					6-12	SiL	12	65	23	3.13	0		Non-plastic		1.27	37.8	32.1
					12-18	SiL	8	70	22	2.60					---	---	---
Carrington	13	Arlington, Columbia	Grasses, hay	Upland 5 percent	0-6	L	47	48	38	2.87					1.44	28.2	21.6
					6-12	L	36	34	43	1.77	2		Non-plastic		1.49	27.9	22.3
					12-18	L	17	18	19	.86					---	---	---
Carrington	14	Arlington, Columbia	Clover and grasses, hay	Upland 2 percent	0-6	SiCL	9	58	33	5.56					1.22	44.2	38.9
					6-12	SiCL	4	62	34	5.56	1	43	28	25	1.08	51.0	38.1
					12-18	SiCL	4	63	33	5.12					---	---	---
Clinton	41	Viroqua, Vernon	Grasses and clover, hay	Upland 7 percent	0-6	SiL	12	62	26	3.96					1.35	34.8	30.6
					6-12	SiL	8	70	22	2.35	0	36	24	12	1.35	36.0	31.1
					12-18	SiCL	3	69	28	2.87					---	---	---
Coloma	7	Hancock, Waushara	Oak, undisturbed	Upland level	0-6	LS	82	8	10	1.88					1.34	33.5	16.9
					6-12	LS	81	12	7	.55	1		Non-plastic		1.55	23.1	12.0
					12-18	SL	77	14	9	.55					---	---	---
Coloma	8	Hancock, Waushara	Oak and shrubs, undisturbed	Upland 4 percent	0-6	SL	79	12	9	2.60					1.22	41.8	30.0
					6-12	SL	80	11	9	.70	1		Non-plastic		1.47	27.0	10.0
					12-18	SL	79	12	9	.70					---	---	---
Dakota	110	Deer Park, St. Croix	Alfalfa, hay	Upland 3 percent	0-6	L	41	45	14	3.13					1.60	23.6	21.4
					6-12	L	41	45	14	1.88	3	22	16	6	1.64	21.4	20.2
					12-18	L	31	46	23	.95					---	---	---
Dodgeville*	40	Lancaster, Grant	Alfalfa, hay	Upland 6 percent	0-6	SiCL	4	67	29	2.08					1.33	35.0	31.6
					6-12	SiCL	4	58	38	1.33	0	39	21	18	1.30	35.6	30.1
					12-18	SiCL	5	60	35	.86					---	---	---
Dubuque*	39	Lancaster, Grant	Grasses, undisturbed	Upland 4 percent	0-6	SiCL	8	68	24	2.75					1.34	34.0	30.6
					6-12	SiCL	3	64	33	.95	3	34	21	13	1.35	33.7	27.9
					12-18	SiCL	6	58	36	.55					---	---	---
Dubuque*	43	Viroqua, Vernon	Grasses, lightly grazed	Upland 6 percent	0-6	SiL	6	75	19	2.75					1.27	39.0	32.6
					6-12	SiL	4	74	22	2.08	1		Non-plastic		1.22	39.7	34.4
					12-18	SiCL	3	63	34	.62					---	---	---
Edgerton	16	Stoughton, Dane	Clover and grasses, hay	Upland level	0-6	SiL	6	74	20	2.87					1.26	40.8	33.5
					6-12	SiL	6	69	25	1.98	0	30	23	7	1.26	47.2	40.3
					12-18	SiCL	3	62	35	.70					---	---	---
Fayette*	38	Lancaster, Grant	Grasses, hay	Upland 5 percent	0-6	SiCL	3	59	38	4.80					1.38	33.6	30.7
					6-12	SiCL	3	62	35	2.87	2	36	23	13	1.20	42.0	34.2
					12-18	SiCL	4	58	38	1.65					---	---	---
Freer	113	Amery, Polk	Grasses, hay	Upland 2 percent	0-6	SiL	23	61	16	3.54					1.43	31.6	27.7
					6-12	SiL	21	65	14	2.75	4	26	22	4	1.33	33.9	28.0
					12-18	SiL	27	52	21	1.77					---	---	---
Geneseo	4	Stevens Point, Portage	Grasses, undisturbed	Bottom level	0-6	L	41	35	24	3.62					1.35	30.9	21.2
					6-12	L	49	30	21	1.65	0	24	16	8	1.56	22.7	15.0
					12-18	L	50	31	19	.55					---	---	---
Geneseo	5	Stevens Point, Portage	Grasses and weeds, undisturbed	Bottom level	0-6	SL	76	16	8	1.65					1.21	37.8	29.1
					6-12	SL	76	16	8	.78	3		Non-plastic		1.48	25.8	17.9
					12-18	LS	85	9	6	.38					---	---	---
Gloucester	1	Wausau, Marathon	Clover, hay	Upland 4 percent	0-6	SiL	25	55	20	3.27					1.35	34.1	29.3
					6-12	CL	23	44	33	.78	4	22	18	4	1.40	32.2	28.0
					12-18	CL	25	46	29	.46					---	---	---
Gloucester	53	Prentice, Price	Grasses, lightly grazed	Upland 5 percent	0-6	SiL	32	52	16	3.62					1.28	34.2	29.7
					6-12	SiL	35	51	14	1.45	4		Non-plastic		1.33	34.1	27.3
					12-18	SiL	50	38	12	.55					---	---	---
Gloucester	54	Prentice, Price	Birch, maple and cherry, logged	Upland 10 percent	0-6	L	51	36	13	3.96					.98	56.3	34.8
					6-12	SL	64	25	11	.86	8		Non-plastic		1.20	41.4	31.4
					12-18	L	48	36	16	2.35					---	---	---
Gloucester	56	Marshfield, Wood	Grasses, hay	Upland 10 percent	0-6	SiL	13	64	23	3.41					1.25	42.0	35.3
					6-12	SiL	12	64	24	1.25	5		Non-plastic		1.26	38.6	34.2
					12-18	SiL	19	59	22	.86					---	---	---

* Soil series identified from farm plan soil maps prepared by the Soil Conservation Service.

(Continued)

Table 5. Wisconsin soil series: site descriptions and soil properties (continued)

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. depth by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmosphere tension
Janesville	15	Stoughton, Dane	Grasses and weeds, hay	Upland 3 percent	0-6	CL	26	41	33	2.47					1.29	42.1	27.9
					6-12	L	37	38	25	2.35	4	Non-plastic			1.36	35.8	25.6
					12-18	L	51	30	19	1.88					---	---	---
Jewette*	108	Baldwin, St. Croix	Grasses and clover, hay	Upland 10 percent	0-6	L	36	46	18	2.87					1.46	29.1	25.2
					6-12	L	35	47	18	1.25	2	23	17	6	1.49	26.8	21.4
					12-18	L	31	45	24	.86					---	---	---
Kennan	121	Park Falls, Price	Hemlock and maple, logged	Upland 2 percent	0-6	L	51	39	10	4.70					.90	60.9	35.9
					6-12	SL	56	36	8	2.87	8	Non-plastic			1.04	51.4	30.2
					12-18	SL	60	32	8	1.65					---	---	---
Kennan	122	Park Falls, Price	Grasses, lightly grazed	Upland 3 percent	0-6	SiL	32	57	11	4.15					1.11	48.8	40.1
					6-12	L	44	48	8	2.23	10	Non-plastic			1.17	42.8	34.0
					12-18	L	47	41	12	1.33					---	---	---
Merrimack	55	Prentice, Price	Grasses, hay	Terrace level	0-6	SiL	19	61	20	3.27					1.21	41.2	35.6
					6-12	SiL	18	66	16	2.60	0	Non-plastic			1.27	38.0	32.4
					12-18	SiL	19	65	16	1.25					---	---	---
Miami	10	Arlington, Columbia	Grasses and clover, lightly grazed	Upland 12 percent	0-6	SL	77	15	8	.95					1.47	28.6	12.0
					6-12	SL	77	20	8	.86	0	Non-plastic			1.59	22.0	12.8
					12-18	SL	70	22	8	.38					---	---	---
Miami	11	Arlington, Columbia	Grasses and clover, moderately grazed	Upland 15 percent	0-6	SiL	10	71	19	2.75					1.23	37.8	30.7
					6-12	SiL	10	68	22	1.05	0	26	21	5	1.37	34.0	25.7
					12-18	SiCL	17	51	32	.46					---	---	---
Miami	12	Arlington, Columbia	Oak and hickory, undisturbed	Upland 20 percent	0-6	L	49	39	12	3.27					1.27	36.7	28.7
					6-12	L	48	38	14	.78	0	--	--	--	1.48	26.9	21.0
					12-18	L	44	37	19	.62					---	---	---
Milaca	111	Deer Park, St. Croix	Aspen, maple and oak, undisturbed	Upland 2 percent	0-6	SL	68	26	6	3.13					1.30	36.6	32.9
					6-12	SL	66	26	8	1.88	5	Non-plastic			1.65	19.4	18.4
					12-18	SL	55	35	10	.95					---	---	---
Ontonagon	123	Mellen, Ashland	Ash, maple and aspen, undisturbed	Upland 7 percent	0-6	SL	69	23	8	4.90					1.02	56.0	49.5
					6-12	SL	69	24	7	1.45	10	Non-plastic			1.36	34.7	29.5
					12-18	SL	65	27	8	.95					---	---	---
Onamia	109	Baldwin, St. Croix	Grasses, undisturbed	Upland level	0-6	SiCL	20	53	27	5.34					1.05	46.6	31.4
					6-12	SiL	22	56	22	4.90	5	38	26	12	1.21	40.6	28.2
					12-18	SiL	24	56	20	3.13					---	---	---
Ontonagon	124	Ashland, Bayfield	Grasses, grazed	Upland 4 percent	0-6	C	17	35	48	5.12					1.19	43.0	38.8
					6-12	C	9	29	62	1.05	0	55	22	33	1.37	36.5	34.9
					12-18	C	5	25	70	.70					---	---	---
Ontonagon	125	Ashland, Bayfield	Grasses, undisturbed	Upland 2 percent	0-6	CL	20	42	38	6.28					1.05	54.7	50.5
					6-12	C	17	35	48	1.55	0	41	19	22	1.43	33.9	32.0
					12-18	C	13	31	56	.46					---	---	---
Plainfield	2	Wausau, Marathon	Maple and basswood, undisturbed	Terrace 10 percent	0-6	SL	76	14	10	3.27					1.31	33.7	20.3
					6-12	SL	79	12	9	1.25	1	Non-plastic			1.56	21.1	11.6
					12-18	LS	81	12	7	.86					---	---	---
Plainfield	45	Black River Falls, Jackson	Oak and pine, undisturbed	Terrace 3 percent	0-6	LS	81	15	4	.95					1.44	28.2	15.1
					6-12	S	90	8	2	.55	0	Non-plastic			1.51	20.7	6.8
					12-18	S	90	8	2	.55					---	---	---
Plainfield	118	Minocqua, Oneida	Jack pine, undisturbed	Terrace level	0-6	SL	67	26	8	2.60					1.05	47.2	34.2
					6-12	SL	65	27	8	1.15	5	Non-plastic			1.07	47.9	34.5
					12-18	SL	68	26	6	.62					---	---	---
Plainfield	120	Minocqua, Oneida	Jack pine, undisturbed	Terrace level	0-6	LS	82	14	4	2.87					1.09	46.1	26.1
					6-12	LS	83	13	4	1.05	5	Non-plastic			1.16	40.1	30.0
					12-18	LS	83	13	4	.62					---	---	---
Spencer	51	Colby, Marathon	Grasses, hay	Upland 5 percent	0-6	SiL	16	62	22	4.70					1.12	45.6	35.8
					6-12	SiL	11	67	22	2.47	2	32	26	6	1.22	39.5	33.8
					12-18	SiL	13	61	26	.95					---	---	---
Spencer	52	Colby, Marathon	Grasses, hay	Upland 3 percent	0-6	SiL	17	59	24	5.12					1.20	42.4	36.4
					6-12	SiL	8	70	22	2.08	3	37	22	15	1.27	39.0	31.5
					12-18	SiCL	5	63	32	1.25					---	---	---
Spencer	115	Weyerhauser, Rusk	Aspen, undisturbed	Upland 3 percent	0-6	L	42	48	10	3.41					1.06	48.3	35.2
					6-12	L	39	49	12	1.65	5	Non-plastic			1.34	32.7	23.1
					12-18	SiL	34	56	10	1.15					---	---	---
Spooner	112	Amery, Polk	Grasses, moderately grazed	Upland 6 percent	0-6	SiL	21	59	18	3.54					1.18	42.8	38.0
					6-12	SiL	22	62	16	.62	8	25	17	8	1.46	26.9	23.3
					12-18	SiL	24	56	20	.62					---	---	---
Tama	42	Viroqua, Vernon	Grasses and weeds, undisturbed	Upland 3 percent	0-6	SiCL	5	63	32	6.04					1.29	38.8	34.9
					6-12	SiCL	4	66	30	4.52	0	42	26	16	1.29	41.5	35.8
					12-18	SiCL	3	67	30	2.87					---	---	---

(Continued)

Table 5. Wisconsin soil series: site descriptions and soil properties (continued)

Soil series	Site number	Weather station and county	Vegetation and land use	Topographic position and slope	Depths sampled inches	Texture class	Mechanical analysis by weight percent			Organic matter by weight percent	Stone content 0-18-in. depth by volume percent	Plasticity constants by weight percent			Bulk density grams per cc.	Soil moisture by weight, percent	
							Sand	Silt	Clay			Liquid limit	Plastic limit	Plasticity index		Saturation	.06 Atmosphere tension
Union	46	Black River Falls, Jackson	Grasses, lightly grazed	Upland 17 percent	0-6	SiL	8	74	18	2.35	0	27	22	5	1.29	35.2	32.0
					6-12	SiL	7	70	23	.70					1.39	31.6	27.9
					12-18	SiL	9	66	25	.55					---	---	---
Union	50	Fairchild, Jackson	Grasses, lightly grazed	Upland 5 percent	0-6	SiL	24	57	19	3.00	1	26	19	7	1.37	34.7	27.2
					6-12	SiL	20	58	22	.55					1.43	30.7	25.4
					12-18	SiL	25	53	22	.38					---	---	---
Vesper	49	Fairchild, Jackson	Oats, cultivated	Upland 3 percent	0-6	L	49	41	10	2.60	2	16	14	2	1.37	36.2	25.7
					6-12	L	52	38	10	1.05					1.46	27.6	22.5
					12-18	L	46	39	15	.70					---	---	---
Vilas	119	Minocqua, Oneida	Maple and aspen, undisturbed	Upland level	0-6	SL	59	33	8	2.87	10	Non-plastic			1.01	52.7	39.1
					6-12	SL	62	30	8	1.45					1.20	39.8	31.3
					12-18	SL	67	27	6	.62					---	---	---
Waukesha	3	Stevens Point, Portage	Jack pine, undisturbed	Terrace level	0-6	LS	78	16	6	3.27	0	Non-plastic			1.21	41.6	22.3
					6-12	SL	78	12	10	.86					1.34	33.4	13.5
					12-18	LS	83	10	7	.55					---	---	---
Waukesha	6	Hancock, Waushara	Grasses, undisturbed	Terrace level	0-6	LS	85	6	9	2.36	1	Non-plastic			1.48	26.2	16.3
					6-12	LS	86	7	7	1.25					1.64	20.3	10.7
					12-18	S	90	6	4	1.05					---	---	---
Waukesha	9	Hancock, Waushara	Grasses, undisturbed	Terrace level	0-6	SL	79	12	9	1.88	1	Non-plastic			1.33	32.1	16.4
					6-12	SL	77	16	7	.78					1.57	22.3	12.7
					12-18	SL	77	17	6	.38					---	---	---
	114	Weyerhauser, Rusk	Grasses, undisturbed	Upland 5 percent	0-6	SiL	19	69	12	4.15	6	Non-plastic			1.10	47.4	36.6
					6-12	SiL	23	65	12	1.45					1.31	31.0	24.8
					12-18	SiL	29	57	14	.85					---	---	---
	116	Ladysmith, Rusk	Grasses, undisturbed	Upland 3 percent	0-6	L	46	44	10	2.47	3	Non-plastic			1.26	34.4	24.2
					6-12	SL	68	24	8	1.15					1.47	25.0	20.7
					12-18	SL	67	21	12	.46					---	---	---
	117	Ladysmith, Rusk	Aspen, undisturbed	Upland 3 percent	0-6	SiL	30	52	18	4.70	6	Non-plastic			.89	63.6	45.2
					6-12	SiL	28	60	12	1.25					1.41	28.2	24.7
					12-18	SiL	31	55	14	.86					---	---	---
	168	Minong, Washburn	Grasses, lightly grazed	Upland 3 percent	0-6	SL	70	22	8	3.13	20	Non-plastic			1.55	24.1	17.7
					6-12	SL	73	17	10	1.55					1.77	16.6	10.9
					12-18	LS	82	13	5	.46					---	---	---
	169	Minong, Washburn	Weeds and grasses, undisturbed	Upland 3 percent	0-6	SL	65	25	10	2.87	10	Non-plastic			1.29	36.5	28.1
					6-12	SL	72	20	8	.86					1.48	25.8	21.8
					12-18	LS	75	21	4	.38					---	---	---
	170	Minong, Washburn	Oak and maple, undisturbed	Upland 3 percent	0-6	SiL	28	56	16	5.12	5	Non-plastic			1.06	45.3	36.9
					6-12	SiL	35	52	13	1.65					1.36	33.2	29.9
					12-18	L	47	41	12	.78					---	---	---